

CLAIMS

What is claimed is:

1. A method for link level alignment of processing modules in a distributed processing environment, the method comprising:
 - 5 (a) at a first processing module, sending an alignment request message to a second processing module;
 - (b) including, in the alignment request message, at least one link level communications protocol version supported by the first processing module;
 - 10 (c) at the second processing module, receiving the alignment request message, selecting a link level communications protocol version based on the version in the alignment request message and parameter values for that version;
 - (d) sending an alignment grant message from the second processing
15 module to the first processing module including the selected link level communications protocol version and the parameter values;
 - (e) at the first processing module, receiving the alignment grant message, selecting link level communications parameter values based on the parameters in the alignment grant message and
20 sending an alignment grant acknowledgement message including the selected parameter values to the second processing module;
and

- (f) sending messages between the first and second processing module using the selected link level communications protocol version and parameter values.
2. The method of claim 1 wherein sending an alignment request message
5 includes sending an alignment request (ARQ) link status signal unit (LSSU) including a payload, the payload including the link level communications protocol version.
3. The method of claim 2 wherein sending an alignment grant message
10 includes sending an alignment grant (AGR) link status signal unit (LSSU) including a payload, the payload storing the selected link level communications protocol version and parameter ranges for that version.
4. The method of claim 3 wherein sending an alignment grant acknowledgement message includes sending an alignment grant
15 acknowledge (AGA) link status signal unit (LSSU) including a payload, the payload storing the selected protocol version and the parameter values selected by the first processing module.
5. The method of claim 1 comprising sending an alignment grant message from the first processing module to a third processing module that does not support link level communications protocol parameter negotiation.
- 20 6. The method of claim 5 comprising, at the third processing module, formulating an alignment grant message and forwarding the alignment grant message to the first processing module.
7. The method of claim 6 comprising, at the first processing module, in response to receiving the alignment grant message, formulating an

alignment grant acknowledge message and sending the alignment grant acknowledge message to the third processing module.

8. The method of claim 7 comprising performing link level communications between the first and third processing modules using a default set of link level communications protocol parameters supported by the first and third processing modules.
9. The method of claim 1 wherein steps (a)-(f) are performed by SS7 link interface modules in a signal transfer point.
10. The method of claim 1 wherein step (a) occurs independently of application data that the first processing module has to send.
11. A method for negotiating link level communications parameters between processing modules in a distributed processing system, the method comprising:
 - (a) exchanging messages between first and second processing modules for establishing link level communications between the first and second processing modules, the messages including link level communications protocol parameters supported by the first and second processing modules;
 - (b) agreeing on a common set of link level communications protocol parameters usable by the first and second processing modules; and
 - (c) establishing link level communications between the first and second processing modules using the common set of parameters.

12. The method of claim 11 wherein exchanging messages between first and second processing modules includes exchanging link status signaling units (LSSUs) between the first and second processing modules.
- 5 13. The method of claim 12 wherein exchanging LSSUs between the first and second processing modules includes sending an alignment request (ARQ) LSSU from the first processing module to the second processing module, the alignment request including a payload carrying a range of link level communications protocol versions supported by the first
10 processing module.
14. The method of claim 13 wherein exchanging LSSUs includes, at the second processing module, in response to receiving the ARQ LSSU, sending an AGR LSSU to the first processing module, the AGR LSSU including a communications protocol version selected by the second
15 processing module within the range of link level communications protocol versions in the ARQ LSSU and parameter values associated with the selected link level communications protocol version.
15. The method of claim 14 wherein exchanging LSSUs includes, at the first
20 processing module, in response to receiving the AGR LSSU, sending an alignment grant acknowledgment (AGA) LSSU to the first processing module, the alignment grant acknowledgement LSSU including parameters selected from the parameter values received in the AGR LSSU.

16. The method of claim 11 wherein the link level communications protocol parameters include a link level communications protocol version.
17. The method of claim 11 wherein the link level communications protocol parameters include at least one of a retransmission algorithm and
5 retransmission timers.
18. The method of claim 11 wherein the link level communications protocol parameters include data rates supported by the first and second processing modules.
19. The method of claim 11 wherein exchanging messages between the first
10 and second processing modules includes exchanging the messages independently of application data ready to be sent by the first and second processing modules.
20. The method of claim 11 comprising exchanging messages between the first processing module and a third processing module that does not
15 support link level communications parameter negotiation and establishing communications between the first and third processing modules using a default set of parameters supported by the third processing module.
21. The method of claim 20 wherein exchanging messages between the first
20 and third processing modules includes exchanging link status signal units (LSSUs) between the first and third processing modules.
22. The method of claim 21 wherein exchanging link status signal units between the first and third processing modules includes sending an alignment request (ARQ) LSSU from the first processing module to a

third processing module, the alignment request LSSU including a range of communications protocol versions supported by the first processing module.

23. The method of claim 22 wherein exchanging LSSUs between the first
5 and third processing modules includes, at the third processing module, in response to receiving the alignment request, formulating an alignment grant LSSU with no payload and sending the alignment grant LSSU to the first processing module.
24. The method of claim 23 wherein exchanging LSSUs between the first
10 and third processing modules comprises, at the first processing module, receiving the alignment grant LSSU, and sending an alignment grant acknowledgment LSSU without a payload to the third processing module.
25. The method of claim 24 wherein establishing link level communications
15 between the first and third processing module includes establishing link level communications after sending the alignment grant acknowledgement LSSU.
26. A system for link level alignment of processing modules in a distributed processing system, the system comprising:
- 20 (a) first and second processing modules coupled to a common bus and supporting link level communications parameter negotiation; and
- (b) a third processing module coupled to the bus, the third processing module not supporting link level communications

5 protocol parameter negotiation, wherein the first and second
 processing modules are adapted to negotiate link level
 communications protocol parameters with each other and to
 communicate with each other using the negotiated parameters
 and wherein the first and second processing modules are
 adapted to communicate with the third processing module using
 a default set of link level communications protocol parameters
 supported by the third processing module.

10 27. The system of claim 26 wherein the first, second, and third processing
 modules comprise SS7 link interface modules.

 28. The system of claim 26 wherein at least one of the first, second, and
 third processing modules comprises a data communications module for
 sending and receiving IP telephony signaling messages over IP
 signaling links.

15 29. The system of claim 26 wherein at least one of the first, second, and
 third processing modules comprises a database services module for
 performing a database function for received telecommunications
 signaling messages.

20 30. The system of claim 26 wherein the first processing module is adapted
 to send an alignment request message to the second processing
 module to negotiate a link level communications protocol version.

 31. The system of claim 30 wherein, in response to receiving the alignment
 request message, the second processing module is adapted to send an
 alignment grant message including a link level communications protocol

version supported by the second processing module and parameters associated with the protocol version.

32. The system of claim 31 wherein, in response to receiving the alignment grant message, the first processing module is adapted to send an alignment grant acknowledgment message to the second processing module, the alignment grant acknowledgement message including parameters selected by the first processing module for link level communications with the second processing module.
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33. The system of claim 32 wherein the alignment request, the alignment grant, and the alignment grant acknowledge messages comprise link status signal units (LSSUs) having payloads for carrying link level communications protocol parameters.
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34. The system of claim 26 wherein the first and second processing modules are adapted to discover that the third processing module does not support link level communications parameter negotiation by exchanging link status signal units (LSSUs) with the third processing module.
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35. The system of claim 34 wherein the first and second processing modules are adapted to negotiate the link level communications protocol parameters by exchanging LSSUs to negotiate a parameter exchange protocol and to negotiate the parameters using the parameter exchange protocol.
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36. The system of claim 34 wherein the first and second processing modules are adapted to exchange messages for negotiating the link

level communications protocol parameters independently of application data ready to be sent by the first and second processing modules.